Letters to the Editor

Reporting Sensitivity and Resistance of Bacteria to Antibiotics

To the Editor:

Once again I call upon *Infection Control and Hospital Epidemiology* to assist in the resolution of a problem that probably concerns infection control and pharmacy therapeutics committees in acute hospital settings compared with long-term skilled nursing facilities.

In reporting sensitivity and resistance of bacteria to antibiotics, it is either as the values of minimum inhibitory concentration (MIC) or Kirby-Bauer. In the population in skilled nursing facilities (SNFs) and the actual difficulty and reluctance of attending men to monitor their patients as closely as those in the acute environment, what would be the preferable system to use for the antibiotics of choice? Is there any difference in the results based upon the zone ofinhibition that is seen on the plate! Is there any compatibility or interchange in the two tests? Is there a preference in the use of either test, depending on factors such as age, weight and location of the patient or whether the infection is nosocomial versus community acquired? And lastly, does prior or current monotherapy versus multi-antibiotic therapy affect the choice of the test?

Harry J. Silver, MD
Los Angeles, California

This question was referred to Michael A. Pfaller, MD.

The choice between MIC versus Kirby-Bauer disk diffusion testing depends on several factors, including the workload of the laboratory, the number of antibiotics to be tested, the financial resources available and the needs of the physicians caring for the patients. The Kirby-Bauer method is inexpensive, simple to perform, Hexible and provides qualitative information as to the susceptibility or resistance of the test organism to various antibiotics. The MIC test, using one of a number of commercially available test panels, is also simple and flexible but is relatively more expensive and provides quantitative data.

The relationship between the MIC and Kirby-Bauer test results is well defined for each of the commonly used antibiotics. In general, the diameter of the zone of inhibition obtained with the Kirby-Bauer method is directly proportional to the MIC for a given organism-drug combination. The susceptibility breakpoints for both methods are assigned based on the distribution of strains as to susceptibility ranges and the levels of antibiotics achievable in vivo. The two approaches to in vitro susceptibility testing are essentially interchangeable with respect to their clinical usefulness. Neither of these methods are influenced by host factors, antibiotic therapy of the host, or nosocomial versus community-acquired infection. Although these are all factors that may influence the choice of therapy for a given infection they do not affect the test method.

Michael A. Pfaller, MD
Iowa City, Iowa

Calculating Infection Control Rates

To the Editor:

I am interested in obtaining answers to the following questions:

- Is there a universal way to calculate hospital infection rates! Apparently any institution can "customize" their own formula in calculating the hospital's infection rate.
- Should there be a universally accepted formula for calculating hospital infection rates that can be applied easily from one similar institution to another?
- What is the best formula for acute and long-term care facilities?

Manuel H. Moraleda, MD
Battle Creek, Michigan

This letter was referred to Elizabeth Bolyard, RN, MPH, CIC.

One of the difficulties that the specialty of hospital epidemiology has encountered during its developmental years is the lack of uniformity among institutions for calculating hospital infection rates. In the early years most practitioners used number of infections and number of patients with infections as the numerator and number of hospital admissions or discharges as the denominator, which is actually a ratio and not a rate. As you would expect, this made comparisons between hospitals difficult as severity of illness affected patient length of stay within the different hospitals. In some hospitals where the average length of stay was short, such as hospitals with large obstetric services, the denominator increased and therefore the hospital-wide incidence rates appeared low. In institutions with long stays, the inverse was the case. Comparisons, therefore, were not valid.

The method of calculating rates using only the total number of patients, as described above, does not take into effect time of infection or duration of risk. Many people today are using number of infections as the numerator but are using the average length of stay or number of patient days as the denominator for calculating hospital-wide or unit-specific incidence rates, which accounts for the effect

of time exposed to risk. This type of rate can also be used for calculating procedure/device specific rates. An example would be the number of patients with central line bacteremias *as* the numerator and the number of days of central lines in place in the population during the same time period as the denominator. However, this rate still does not account for the additive effect on infection of underlying disease.

The use of hospital-wide infection rates are of little use in describing problem areas or in assessing preventive measures. Gathering site or procedure specific data, including risk factors, will provide much more useful information for utilization in individual health care institutions. In the past, we used incidence rates to describe a problem in our institutions without comparing patients who were infected to those who were not infected. Without this important comparison, disease causation truly cannot be evaluated. By using procedure specific information and comparing the pertinent risk factors of infected and noninfected, we can more carefully evaluate the causes of nosocomial events.

As the science of hospital epidemiology continues to mature, we expect to see our rates become even more specific as we begin adjusting for severity of illness. This will become possible because of the fact that hospitals will have data bases with severity of illness indexes to enable them to provide more accurate outcome measurement statistics to outside agencies. By having these data available, we will be able to further refine our statistics and have data that can be used for comparisons between hospitals following statistical adjustment for severity of illness. Without such adjustment, the inter-hospital comparisons may not be valid.

The majority of infection control epidemiologists agree that we need a standardized system for measuring infection risk and prevention activities, but the standard only now is being developed. Research activities are ongoing to determine appropriate severity of illness indexes to use in the adjustment of rates. No matter what method is used for calculation of rates, comparisons between hospitals will not be possible unless there is standard application of surveillance definitions when determining infection. A study is also underway to evaluate the reliability and validity of infection surveillance data in a random sample of infection control practitioners.

As a more direct answer to vour questions, no there is not a universal way to calculate infection rates. Yes, one is needed to enable valid comparisons between health care institutions. And finally, at the current time the best formula for calculating infection rates in both acute and long term facilities would be the use of number of patient days × 1000 in the denominator. To provide more detailed information on which to base and evaluate preventive measures, use procedure/device specific rates with the denominator reflecting which patients truly are at risk for that infection and then compare those who got infected with those who did not. If possible, adjust your data for severity of underlying disease in your patients.

Elizabeth Bolyard, RN, MPH, CIC
Baltimore, Maryland

Blood Culture Collection and Needle Punctures in Healthcare Workers

To the Editor:

In the past, a common practice in collecting blood cultures has been removing the needle from the syringe after performing the venipuncture and/or after inoculating the first of two culture bottles with blood, in order to decrease the likelihood of contaminating the culture with skin or environmental bacterial flora. Recently, a physician in our hospital sustained a puncture wound on the hand from a needle used to collect a blood specimen for culture from a patient with acquired immunodeficiency syndrome (AIDS). She was attempting to remove the unsheathed needle from the syringe in order to replace it with a new needle to inoculate the culture bottle. In our hospital, the Infection Control Office has no specific recommendations on the technique for collecting blood cultures, other than the general recommendation to avoid recapping needles. The Department of Clinical Pathology does set forth guidelines for specimen collection in their procedure manual. However, their guidelines address the issue of aseptic technique in specimen collection, but not avoidance of needle puncture injuries. When questioned, a number of our houseofficers expressed the belief that they were expected to change needles when drawing blood cultures, despite their awareness of the recommendation to avoid recapping or otherwise manipulating needles.

To determine whether this problem existed only in our hospital or was more widespread, we contacted the chief infection control nurse at each of four east coast university hospitals and one large local community hospital with residency training programs in several specialties. The nurses at all four of the university hospitals surveyed stated that persons drawing blood cultures in their respective institutions changed needles after performing the venipuncture and before inoculating the culture bottle. One stated that it was recommended to remove the unsheathed needle from the syringe with a hemostat. Two others stated that it was recommended to recap the needle by resting the cap on a firm Hat surface with one hand and gently guiding the needle into the cap with the other. The nurse at the community hospital was not aware of any healthcare workers changing needles during blood culture collection in her institution. The infection control nurses also were asked if there was a specific policy regarding the technique for the collection of blood cultures in their institution. In no instance was there a policy or procedure guide-

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